CLAIMS

1. A tube holder for use with a peristaltic pump, the tube holder including:
a housing having a recess for receipt of a pump rotor, a tube race for receipt of a tube around the recess and having a first race part around one part of the recess and a second race part around another part of the recess, a first tube inlet into the first race part and a first tube outlet from the first race part, a second tube inlet into the second race part and a second tube outlet from the second race part;
the tube being insertable in the tube race by movement in a substantially orthogonal direction relative to the tube race so that it extends in through the first tube inlet, around the first race part, out through the first tube outlet, in through the second tube inlet, around the second race part, and out through the second tube outlet.

2. A tube holder as claimed in claim 1, wherein the first tube outlet and second tube inlet are configured such that the tube can exit the housing between the first outlet and second inlet.

3. A tube holder as claimed in claim 1, wherein the first tube outlet and second tube inlet are in communication with a recess or groove which is separate to the tube race, but which is located within the housing.

4. A tube holder as claimed in any one of claims 1 to 3, wherein the housing includes a lip or projection between the first outlet and the second inlet, behind which the tube can be located to maintain the tube in position within the tube race.

5. A tube holder as claimed in any one of claims 1 to 4, wherein the recess is tapered for receipt of a tapered pump rotor.

6. A tube holder as claimed in claim 5, wherein each tube race part is defined by a channel or groove extending inwardly from a respective tube inlet and tube outlet.

7. A tube holder as claimed in claim 6, wherein the grooves extend part way around the recess.

8. A tube holder as claimed in claim 7, wherein the recess provides surfaces against which the tube is occluded to pump fluid therethrough in use.

9. A tube holder as claimed in any one of the preceding claims, wherein the tube holder is a one-piece article.

10. The combination of a tube holder as claimed in any one of the preceding claims and a pump head having a tapered rotor which is received in the recess of the tube holder, such that actuation of the pump head causes fluid to be pumped through a tube in the tube holder by occlusion of the tube.

11. The combination as claimed in claim 10, wherein the tube is resiliently flexible so that it returns substantially to its original shape following occlusion, to thereby suck fluid through the tube.

12. The combination as claimed in claim 10 or 11, wherein the rotor is axially biased towards its tapered end, such that the pump rotor and tube race are self-adjusting, to maintain a desired pressure on a tube in the tube race during pumping.

13. The combination as claimed in claim 12, wherein the rotor is axially biased by a compression spring.

14. The combination as claimed in claim 12 or 13, including a stop to limit the axial movement of the rotor relative to the housing.

15. The combination as claimed in claim 14, wherein the stop is in the form of an annular lip on the rotor.

16. The combination as claimed in any one of claims 13 to 15, wherein the pump head includes a transmission mechanism to transmit motive power from a power source to the rotor, and wherein the base of the tapered rotor includes a plurality of gear teeth which engage with a gear of the transmission mechanism, and wherein the gear teeth of the rotor and the teeth of the gear of the transmission mechanism are of sufficient length to remain engaged during axial movement of the rotor.

17. The combination as claimed in claim 16, wherein the gear teeth of the rotor are elongate and longer than the teeth of the gear.

18. The combination as claimed in any one of claims 10 to 17, wherein part of the rotor is substantially conical or frustoconical, and has a plurality of rollers rotatably mounted thereon which are configured to occlude the tube in use.

19. The combination as claimed in claim 18, wherein the rollers are substantially frustoconical in configuration, with their tapered ends directed towards the tapered end of the rotor.

20. The combination as claimed in claim 19, wherein the rollers are mounted for rotation with axes which taper toward the tapered end of the rotor.

21. The combination as claimed in any one of claims 18 to 20, wherein the rotor includes a main body part and a head part, with the rollers mounted for rotation in a recess or recesses between the main body part and the head part.

22. The combination as claimed in any one of claims 10 to 21, wherein the tube holder and pump head are fully separable from an operable configuration in which the rotor is located in the recess of the tube holder and configured to pump fluid through a tube to a loading configuration in which the tube may be loaded into the tube race.

23. A method of loading a tube into a tube holder including:

providing a tube holder having a housing having a recess for receipt of a pump rotor, a tube race for receipt of a tube around the recess and having a first race part around one part of the recess and a second race part around another part of the recess, a first tube inlet into the first race part and a first tube outlet from the first race part, a second tube inlet into the second race part and a second tube outlet from the second race part;

providing a tube; and

moving the tube in a substantially orthogonal direction relative to the tube race such that it extends in through the first tube inlet, around the first race part, out through the first tube outlet, in through the second tube inlet, around the second race part, and out through the second tube outlet.

24. A method as claimed in claim 23, wherein the tube holder is as claimed in any one of claims 2 to 9.

25. A method as claimed in claim 24, wherein the tube holder includes a retainer which is in the form of a projection or lip between the first outlet and the second inlet, and wherein the method further includes pulling the installed tube in a direction away from the projection or lip so that the tube is maintained in position within the tube race with part of the tube located behind the projection or lip.

26. A method as claimed in any one of claims 23 to 25, wherein the method includes bringing the tube holder into engagement with a pump head to provide the combination of a tube holder and a pump head, and so that the rotor is located in the recess in the tube holder.

27. A method as claimed in claim 26, wherein the combination is as claimed in any one of claims 10 to 22.

28. The combination of a peristaltic pump head having

a tapered pump rotor which is rotatable about an axis of rotation, and a tube holder having a recess for receipt of the tapered end of the rotor, the tube holder having a tube

race configured for receipt of a tube for pumping of a fluid by movement of the rotor, the tube race including a plurality of separate race parts around the recess defined by a plurality of apertures or recesses such that the tube can exit and re-enter the tube race.

29. The combination as claimed in claim 28, wherein the tube is insertable into the tube race without separating the tube holder from the pump head.

30. The combination as claimed in claim 28, wherein the tube holder and pump head are movable from an operable configuration in which the rotor is located in the recess of the tube holder and configured to pump fluid through a tube to a loading configuration in which the tube may be loaded into the tube race.

31. The combination as claimed in claim 30, wherein the tube holder and pump head are fully separable.

32. The combination as claimed in any one of claims 28 to 31, wherein the tube holder has a housing, a first tube race part around one part of the recess defined by a first tube inlet aperture and a first tube outlet aperture, and a second tube race part around another part of the recess defined by a second tube inlet aperture and a second tube outlet aperture, such that movement of a tube threaded therethrough in the axial direction of the rotor is minimised or prevented by the apertures.

33. The combination as claimed in claim 30 or 31, wherein the tube holder is as claimed in any one of claims 1 to 9.

34. The combination as claimed in claim 33, wherein the tube is resiliently flexible so that it returns substantially to its original shape following occlusion, to thereby suck fluid through the tube.

35. The combination as claimed in claim 33 or 34, wherein the rotor is axially biased towards its tapered end, such that the pump rotor and tube race are self-adjusting, to maintain a desired pressure on a tube in the tube race during pumping.

36. The combination as claimed in claim 35, wherein the rotor is axially biased by a compression spring.

37. The combination as claimed in claim 35 or 36, including a stop to limit the axial movement of the rotor relative to the housing.

38. The combination as claimed in claim 37, wherein the stop is in the form of an annular lip on the rotor.

39. The combination as claimed in any one of claims 36 to 38, wherein the pump head includes a transmission mechanism to transmit motive power from a power source to the rotor, and wherein the base of the tapered rotor includes a plurality of gear teeth which engage with a gear of the transmission mechanism, and wherein the gear teeth of the rotor and the teeth of the gear of the transmission mechanism are of sufficient length to remain engaged during axial movement of the rotor.

40. The combination as claimed in claim 39, wherein the gear teeth of the rotor are elongate and longer than the teeth of the gear.

41. The combination as claimed in any one of claims 28 to 40, wherein the tapered part of the rotor is substantially conical or frustoconical, and has a plurality of rollers rotatably mounted thereon which are configured to occlude the tube in use.

42. The combination as claimed in claim 41, wherein the rollers are substantially frustoconical in configuration, with their tapered ends directed towards the tapered end of the rotor.

43. The combination as claimed in claim 42, wherein the rollers are mounted for rotation with axes which taper toward the tapered end of the rotor.

44. The combination as claimed in any one of claims 41 to 43, wherein the rotor includes a main body part and a head part, with the rollers mounted for rotation in a recess or recesses between the main body part and the head part.

45. A peristaltic pump head, including:
a housing;
a transmission mechanism for transmitting motive force from a drive mechanism to a rotor, and including a gear with a plurality of teeth;
a tapered pump rotor mounted for rotation about an axis of rotation within the housing and which is axially biased towards its tapered end, the base of the tapered pump rotor including gear teeth which engage with the teeth of the gear of the transmission mechanism, wherein the gear teeth of the rotor and the teeth of the gear of the transmission mechanism are of sufficient length to remain engaged during axial movement of the rotor relative to the housing.

46. A peristaltic pump head assembly as claimed in claim 45, wherein the gear teeth of the rotor are elongate and longer than the teeth of the gear.

47. A peristaltic pump head assembly as claimed in claim 45 or 46, wherein the transmission mechanism includes a plurality of gears.

48. The combination as claimed in any one of claims 45 to 47, wherein the rotor is axially biased by a compression spring.

49. The combination as claimed in any one of claims 45 to 48, including a stop to limit the axial movement of the rotor relative to the housing.

50. The combination as claimed in claim 49, wherein the stop is in the form of an annular lip on the rotor.

51. A kit of parts for assembling a peristaltic pump head assembly, including:
a rotor and a housing having first and second housing parts and configured for receipt of the rotor; which rotor may be assembled with the housing with at least part of the rotor exposed from the housing for engagement with a tube, by snapping the housing parts together such that the pump head assembly can be assembled without the use of adhesives or separate fasteners.

52. A kit of parts as claimed in claim 51, wherein the rotor is provided in kit form, and includes a main body part, a head part and at least one roller, which rotor may be assembled by snapping the main body part and head part together to sandwich the roller(s) therebetween.

53. A kit of parts as claimed in claim 51 or 52, wherein the rotor is tapered and is mountable for rotation about an axis of rotation within the housing and to be axially biased towards its tapered end, and wherein the rotor includes a stop to limit the axial movement of the rotor relative to the housing when assembled.

54. A kit of parts as claimed in claim 53, including a compression spring to axially bias the rotor relative to the housing.

55. A kit of parts as claimed in claim 53 or 54, wherein a base of the tapered rotor includes gear teeth, and including a gear with a plurality of teeth to transmit motive force from a drive mechanism to the rotor, the gear teeth of the rotor and the teeth of the gear being of sufficient length to remain engaged during axial movement of the rotor relative to the housing once assembled.

56. A kit of parts as claimed in any one of claims 51 to 55, wherein all components are made of a plastics material.

57. A kit of parts as claimed in any one of claims 51 to 55, wherein all components, other than the spring, are made of a plastics material.

58. A flexible container having a reservoir for holding fluid and including a tube holder directly connected to the flexible container, the tube holder having a tube race around a tapered aperture or recess configured for receipt of a tapered rotor of a peristaltic pump head, and a tube connector configured for connection to a resiliently flexible tube and in fluid communication with the reservoir, which tube holder can be brought into operable connection with the pump head to occlude fluid through a tube connected to the tube connector and extending around the tube race to dispense fluid from the container.

59. A flexible container as claimed in claim 58, including a resiliently flexible tube connected to the tube connector and extending around the tube race.

60. A flexible container having a reservoir for holding fluid and including a tube holder directly connected to the flexible container, the tube holder having a tube race around a tapered aperture or recess configured for receipt of a tapered rotor of a peristaltic pump head, and a resiliently flexible tube in fluid communication with the reservoir and extending around the tube race, so that the tube holder can be brought into operable connection with the pump head to occlude fluid through the tube extending around the tube race.

61. A flexible container as claimed in any one of claims 58 to 60, wherein the flexible container includes a plurality of reservoirs sealed from one another, and the tube holder includes a corresponding number of tube races so that the contents of the reservoirs can be independently dispensed via respective tubes.

62. A flexible container as claimed in any one of claims 58 to 61, wherein the tube race(s) has/have a first race part around one part of the recess and a second race part around another part of the recess, a first tube inlet into the first race part and a first tube

outlet from the first race part, a second tube inlet into the second race part and a second tube outlet from the second race part; the respective tube being insertable in the respective tube race by movement in a direction substantially orthogonal to the tube race so that it extends in through the first tube inlet, around the first race part, out through the first tube outlet, in through the second tube inlet, around the second race part, and out through the second tube outlet.

63. A flexible container as claimed in claim 62, including a lip or projection between the first outlet(s) and second inlet(s), behind which the respective tube can be located to maintain the tube in position within the tube race.

64. A flexible container as claimed in claim 63, wherein the container includes a neck portion and two separate reservoir portions in a Y-configuration.

65. A flexible container as claimed in any one of claims 58 to 64, wherein the tube holder includes at least one mounting boss which is located in an aperture in a neck of the container.

66. A flexible container as claimed in claim 65, wherein an aperture extends through the mounting boss(es) and into a spigot(s) which comprise(s) the tube connector to which a respective tube is connected, such that tube(s) is/are in fluid communication with a respective reservoir.

67. A container holding at least one fluid for dispensing by a peristaltic pump, the container including a plurality of discrete magnetic or magnetisable areas in predetermined positions on the container to identify the container, which magnetic or magnetisable areas (once magnetised) are configured for detection by a pump assembly having a plurality of sensors in predetermined positions corresponding to the positions of the magnetic or magnetisable areas.

outlet from the first race part, a second tube inlet into the second race part and a second tube outlet from the second race part; the respective tube being insertable in the respective tube race by movement in a direction substantially orthogonal to the tube race so that it extends in through the first tube inlet, around the first race part, out through the first tube outlet, in through the second tube inlet, around the second race part, and out through the second tube outlet.

63. A flexible container as claimed in claim 62, including a lip or projection between the first outlet(s) and second inlet(s), behind which the respective tube can be located to maintain the tube in position within the tube race.

64. A flexible container as claimed in claim 63, wherein the container includes a neck portion and two separate reservoir portions in a Y-configuration.

65. A flexible container as claimed in any one of claims 58 to 64, wherein the tube holder includes at least one mounting boss which is located in an aperture in a neck of the container.

66. A flexible container as claimed in claim 65, wherein an aperture extends through the mounting boss(es) and into a spigot(s) which comprise(s) the tube connector to which a respective tube is connected, such that tube(s) is/are in fluid communication with a respective reservoir.

67. A container holding at least one fluid for dispensing by a peristaltic pump, the container including a plurality of magnetic or magnetisable areas in predetermined positions on the container to identify the container, which magnetic or magnetisable areas (once magnetised) are configured for detection by a pump assembly having a plurality of sensors in predetermined positions corresponding to the positions of the magnetic or magnetisable areas.

68. A container as claimed in claim 67, wherein the container is of the type claimed in any one of claims 58 to 66, and the magnetic or magnetisable areas are located on the tube holder.

69. A container as claimed in claim 67 or 68, wherein the plurality of magnetic areas are provided by magnets.

70. A container as claimed in claim 67 or 68, wherein the plurality of magnetisable areas are provided by one or more strips of material, discrete part(s) of which can been magnetised.

71. A container as claimed in claim 67 or 68, wherein the plurality of magnetisable areas are provided by a plurality of items of a material which has no magnetic properties until magnetised.

72. The combination of a container as claimed in any one of claims 67 to 71 and a pump assembly including a plurality of sensors in predetermined positions corresponding to the positions of the magnetic or magnetisable areas, the sensors configured to sense whether the corresponding positions are magnetic or magnetised when the container is in close proximity or contact with the pump assembly.

73. The combination as claimed in claim 72, wherein there are a greater number of sensors than there are magnetic or magnetised areas on the container.

74. The combination as claimed in claim 72 or 73, wherein the pump assembly further includes a microprocessor and a memory, which microprocessor is configured to determine from the sensors the numbers and positions of the magnetic or magnetised areas, and to then access the memory to determine the substance(s) in the container.

75. The combination as claimed in claim 74, wherein the microprocessor is configured to activate a software routine associated with the substance(s) of the container

if the number and position of the magnetic or magnetised areas corresponds to a value stored in the memory.

76. The combination as claimed in claim 75, wherein the software routine determines when pump(s) of the pump assembly should be actuated, for how long, and in which combination.

77. The combination as claimed in any one of claims 72 to 76, wherein the sensors are Hall Effect sensors.